

DOBASHI -- 10/091,569
Client/Matter: 008312-0290757

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A face image recognition apparatus comprising:
a memory in which a reference feature amount of a face of a to-be-recognized person is previously registered in correlation with ID information,
an ID information acquiring section which acquires ID information from a person to be recognized,
an image input section which inputs a face image of a person,
a feature amount extracting section which extracts a feature amount of a face based on the face image input by said image input section,
a recognition section which determines a recognition rate that calculates similarity between the feature amount extracted by said feature amount extracting section and the reference feature amount registered in said memory a reference feature amount of a face of a person corresponding to the ID information acquired by the ID information acquiring section, and which determines whether the person to be recognized is the person corresponding to the ID information by checking whether a calculated similarity is greater than a predetermined threshold used for identification, and
a feature amount adding section which additionally registers the feature amount extracted by said feature amount extracting section as a new reference feature amount into said memory a reference feature amount of a second face corresponding to the ID information acquired by the ID information acquiring section, when the recognition rate determined similarly calculated by said recognition section is lower than a preset value predetermined reference value used for additional registration, wherein the predetermined reference value used for additional registration being different from the predetermined threshold used for identification.
2. (Cancelled)
3. (Original) The face image recognition apparatus according to claim 1, which further comprises a camera used to photograph a face image of a person and an illumination

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device used to apply light toward a face of a to-be-photographed person to be photographed by said camera and in which said image input section inputs the face image photographed by said camera.

4. (Original) The face image recognition apparatus according to claim 3, wherein said illumination device includes a first illuminating section which is disposed in an upper right position or upper left position of said camera in an oblique direction as viewed from the to-be-photographed person to apply light toward the face of the to-be-photographed person and a second illuminating section which is disposed below said camera to apply light toward the face of the to-be-photographed person.

5. (Original) A face image recognition apparatus comprising: a memory in which a reference feature amount of a face of a to-be-recognized person is previously registered and a new reference feature amount can be additionally registered,

an image input section which inputs a face image of a person,
a feature amount extracting section which extracts a feature amount of a face based on the face image input by said image input section,

a recognition section which performs a first determining process for determining a recognition rate between the feature amount extracted by said feature amount extracting section and the reference feature amount previously registered in said memory when a new reference feature amount is not additionally registered in said memory, performs a second determining process for determining a recognition rate between the feature amount extracted by said feature amount extracting section and a new reference feature amount additionally registered in said memory when the new reference feature amount is additionally registered in said memory, and performs a third determining process for determining the recognition rate between the feature amount extracted by said feature amount extracting section and the reference feature amount previously registered in said memory when the recognition rate determined by the second determining process is lower than a preset value, and

a feature amount adding section which performs a first additional registration process for additionally registering the feature amount extracted by said feature amount extracting section as a new reference feature amount into said memory when the recognition rate determined by the first determining process of said recognition section is lower than a preset value and performs a second additional registration process for deleting the new reference

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feature amount which is already additionally registered in said memory and additionally registering the feature amount extracted by said feature amount extracting section as a new reference feature amount into said memory when the recognition rate determined by the second determining process of said recognition section is lower than a preset value and the recognition rate determined by the third determining process of said recognition section is lower than a preset value.

6. (Currently Amended) A passage control apparatus which recognizes a face image of a passer and controls the passage of the passer, comprising:

a memory in which a reference feature amount of a face of a person who is permitted to pass through is previously registered in correlation with ID information,

an ID information acquiring section which acquires ID information from a passer,

an image input section which inputs a face image of a the passer,

a feature amount extracting section which extracts a feature amount of a face based on the face image of the passer input by said image input section,

a recognition section which determines a recognition rate which calculates similarity between the feature amount extracted by said feature amount extracting section and the reference feature amount registered in said memory a reference feature amount of a face of a person corresponding to the ID information acquired by the ID information acquiring section, and which determines whether or not the passer is the person corresponding to the ID information by checking whether a calculated similarity is greater than a predetermined threshold used for identification,

a passage control section which controls the passage of the passer based on the recognition rate determined by said recognition section whether or not the passer is the person corresponding to the ID information, and

a feature amount adding section which additionally registers the feature amount extracted by said feature amount extracting section as a new reference amount into said memory a reference feature amount of a second face corresponding to the ID information acquired by the ID information acquiring section, when the recognition rate determined similarity calculated by said recognition section is lower than a preset value predetermined reference value used for additional registration, wherein the predetermined reference value used for additional registration being different from the predetermined threshold used for identification.

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7. (Cancelled)

8. (Original) The passage control apparatus according to claim 6, which further comprises a camera used to photograph a face image of a person and an illumination device used to apply light toward a face of a to-be-photographed person to be photographed by said camera and in which said image input section inputs the face image photographed by said camera.

9. (Original) The passage control apparatus according to claim 8, wherein said illumination device includes a first illuminating section which is disposed in an upper right position or upper left position of said camera in an oblique direction as viewed from the to-be-photographed person to apply light toward the face of the to-be-photographed person and a second illuminating section which is disposed below said camera to apply light toward the face of the to-be-photographed person.

10. (Original) A passage control apparatus which recognizes a face image of a passer and controls the passage of the passer, comprising:

a memory in which a reference feature amount of a face of a person who is permitted to pass through is previously registered and a new reference feature amount of the face of the person who is permitted to pass through can be additionally registered,

an image input section which inputs a face image of a person,

a feature amount extracting section which extracts a feature amount of a face based on the face image of the passer input by said image input section,

a recognition section which performs a first determining process for determining a recognition rate between the feature amount extracted by said feature amount extracting section and the reference feature amount previously registered in said memory when a new reference feature amount is not additionally registered in said memory, performs a second determining process for determining a recognition rate between the feature amount extracted by said feature amount extracting section and a new reference feature amount additionally registered in said memory when the new reference feature amount is additionally registered in said memory, and performs a third determining process for determining the recognition rate between the feature amount extracted by said feature amount extracting section and the

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reference feature amount previously registered in said memory when the recognition rate determined by the second determining process is lower than a preset value, and

a feature amount adding section which performs a first additional registration process for additionally registering the feature amount extracted by said feature amount extracting section as a new reference feature amount into said memory when the recognition rate determined by the first determining process of said recognition section is lower than a preset value and performs a second additional registration process for deleting the new reference feature amount which is already additionally registered in said memory and additionally registering the feature amount extracted by said feature amount extracting section as a new reference feature amount into said memory when the recognition rate determined by the second determining process of said recognition section is lower than a preset value and the recognition rate determined by the third determining process of said recognition section is lower than a preset value.

11. (Currently Amended) A face image recognition method used in a face image recognition apparatus including a memory in which a reference feature amount of a face of a to-be-recognized person is previously registered, comprising:

inputting a face image reference feature amount of a face of a person into a memory in correlation with ID information,

acquiring ID information from the to-be-recognized person.

inputting a face image of the to-be-recognized person,

extracting a feature amount of a face based on the input face image,

determining a recognition rate calculating similarity between the extracted feature amount and the reference feature amount registered in the memory a reference feature amount of a face of a person corresponding to the ID information,

determining whether the to-be-recognized person is the person corresponding to the ID information by checking whether calculated similarity is greater than a predetermined threshold used for identification, and

additionally registering the extracted feature amount as a new reference feature amount into the memory a reference feature amount of a second face corresponding to the acquired ID information, when the determined recognition rate calculated similarity is lower than a preset value predetermined reference value used for additional registration, wherein

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the predetermined reference value used for additional registration being different from the predetermined threshold used for identification.

12. (Cancelled)

13. (Original) A face image recognition method used in a face image recognition apparatus including a memory in which a reference feature amount of a face of a to-be-recognized person is previously registered and a new reference feature amount can be additionally registered, comprising:

inputting a face image of a person,

extracting a feature amount of a face based on the input face image,

determining a recognition rate between the feature amount extracted by the feature amount extracting section and the reference feature amount previously registered in the memory when a new reference feature amount is not additionally registered in the memory,

additionally registering the feature amount extracted from the input face image as a new reference feature amount into the memory when it is determined in said determining step that the recognition rate between the feature amount extracted from the input face image and the reference feature amount previously registered in the memory is lower than a preset value,

determining a recognition rate between the feature amount extracted from the input face image and a new reference feature amount additionally registered in the memory when the new reference feature amount is additionally registered in the memory,

determining the recognition rate between the feature amount extracted from the input face image and the reference feature amount previously registered in the memory when it is determined in said determining step that the recognition rate between the feature amount extracted from the input face image and the new reference feature amount additionally registered in the memory is lower than a preset value, and

deleting the new reference feature amount which is already additionally registered in the memory and additionally registering the feature amount extracted from the input face image as a new reference feature amount into the memory when it is determined in said determining step that the recognition rate between the feature amount extracted from the input face image and the new reference feature amount additionally registered in the memory is lower than a preset value and the recognition rate between the feature amount extracted

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from the input face image and the reference feature amount previously registered in the memory is lower than a preset value.